Space Weather Forecast

Issued on Wednesday 25 September 2024 at 13:30 Local

This forecast provides a four-day assessment of space weather events. The probabilities stated below are for reaching or exceeding the given levels. For more information about space weather impacts please see the Met Office Space Weather Scales https://www.metoffice.gov.uk/weather/learn-about/space-weather/uk-scales

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Space Weather Forecast Headline: Minor Geomagnetic Storm likely, mainly Day 1 (25 Sep). Chance of Moderate flares.

Analysis of Space Weather Activity over past 24 hours

Solar Activity: Activity has been Low with only a Common-class flares observed in the past 24 hours.

There are currently eight sunspot regions on the visible disc. The region close to the southeast limb is the largest on the disc and remains very difficult to assess due to its viewing angle, but appears to have some magnetic complexity developing. Also, some notable looping is evident on coronagraph imagery on the east limb. A small region in the northwest has seen recent proliferation of a number of small spots in both the lead and trailing portions. Two regions in the south east continue to show some slight growth or development. The remaining regions are mostly small or simple and have remained relatively stable over the past 24 hours.

A Coronal Mass Ejection (CME) was observed 22-23 Sep, directed primarily to the south and east, mostly away from Earth. However, analysis suggests a possible glancing blow on Day 1 (25 Sep), likely from the shock associated with the CME. No other Earth-directed CMEs were observed.

Solar Wind / Geomagnetic Activity: The solar wind was initially at, or just below, slightly elevated levels 400-420km/s. Wind speeds then from around 24/2100 UTC, reaching Elevated levels of 500-520 km/s 25/0550-0850 UTC. Winds have since eased slightly and are fluctuating between Elevated and Slightly Elevated levels. The Interplanetary Magnetic Field, was moderate to weak initially, but has remained at moderate levels since around 24/1830 UTC. The important north-south component weakly fluctuated until around 24/1830 UTC. Since then, it has been moderate and mostly southward directed.

Geomagnetic activity was Quiet to Unsettled (Kp 2-3), increasing Active (Kp 4) from 24/2100 UTC before peaking at G1/Minor Geomagnetic Storm (Kp 5) around 25/0300-0600 UTC.

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) remained at background levels throughout.

Four-Day Space Weather Forecast Summary

Solar Activity: Low to Moderate activity is expected, with a chance of isolated Moderate flares.

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Solar Wind / Geomagnetic Activity: The Coronal Mass Ejection (CME) following a flare off the southeast quadrant on 22 Sep may give a glancing blow at Earth on Day 1 (25 Sep) with effects potentially lasting into Day 2 (26 Sep). This may coincide with the ongoing connection to a stream of coronal hole fast winds. However, this aspect of the forecast carries low confidence. Solar winds are currently elevated and are likely to remain at similar levels before gradually easing by the end of Day 2. If we experience a glancing blow from the aforementioned CME then wind speeds could potentially become further enhanced, and slow the return towards background levels.

Geomagnetic activity is forecast to be Unsettled to Active (Kp 3-4) with a likelihood of Active to G1/Minor Storm intervals over the next 12 hours given the potential CME arrival. Geomagnetic activity is likely to gradually ease to Quiet to Unsettled by the end of Day 2 (26 Sep). However, if we see more significant influence from the CME, then geomagnetic activity could become more significantly enhanced, with a slight chance of reaching G2-G3/Moderate-Strong Storm intervals. This is currently considered to be low confidence. Geomagnetic activity is likely to gradually ease to Quiet to Unsettled by the end of Day 2 (26 Sep).

Energetic Particles / Solar Radiation: The count rate of energetic particles (high energy protons) is likely to be at background levels with just a very slight chance of solar radiation storms occurring.

Geomagnetic Storms

Geomagnetic Storm Probability (Exceedance)	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Minor or Moderate	G1 to G2	Yes	100	20	5	5
Strong	G3	No	20	5	1	1
Severe	G4	No	1	1	1	1
Extreme	G5	No	1	1	1	1

Radio Blackouts - X-Ray Flares

X-Ray Flares Probability	Level	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	R1-R2 (M Class)	No	40	40	40	40
Very Active	R3-R5 (X Class)	No	5	5	5	5

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Solar Radiation Storms (High Energy Protons)

Radiation Storms Probability (Exceedance)	Level ($cm^{-2}sr^{-1}s^{-1}$)	Past 24 Hours (Yes/No)	Day 1 (00-24 UTC) (%)	Day 2 (00-24 UTC) (%)	Day 3 (00-24 UTC) (%)	Day 4 (00-24 UTC) (%)
Active	**≥ S1**	No	5	5	5	5
Very Active	**≥ S3 ***	No	1	1	1	1
* S3 ≥ 10 MeV ≥ 1000 pfu and/or 50 MeV ≥ 10pfu. (pfu = $cm^{-2}sr^{-1}s^{-1}$)						

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